Comparison of CALIOP Level 2, Version 3 Backscatter and Extinction products with MPLNET data at Kanpur, India

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Background

• Cloud-Aerosol LIDAR with Orthogonal Polarization (CALIOP), launched aboard the Cloud-Aerosol LIDAR and Infrared Pathfinder Satellite Observation (CALIPSO) in April 2006, provides vertical profiles of backscatter, extinction, optical depth, layer height and thickness.
• The Micro Pulse Lidar Network (MPLNET) is a worldwide network of LIDAR co-located with Aerosol Robotic Network (AERONET) sun/sky photometers. Regular observations from IIT Kanpur site available since May 2009.

Data Analysis

• Comparison of CALIOP derived backscatter and extinction coefficients made with corresponding quantities from Micro Pulse Lidar Network (MPLNET) over Kanpur, India, for May 2009 to September 2010.
• Constraints: Difference between CALIOP and MPLNET observation time should be less than 3 hours.
• 24-hour HYSPLIT Backtrajectory analysis performed to make sure that both the instruments are measuring the same air parcel.
• The 400 m to 6 Km altitude range is divided into 100 m bins, and mean backscatter in each bin calculated. Linear regression of mean backscatters from the two instruments is performed to calculate $R^2$ and slope.
• CALIPSO Vertical Feature Mask, Lidar Ratios used by CALIOP and MPLNET for retrieval, and AERONET Size Distribution are used for detailed examination of the comparisons.
• Under the constraints, 16 cases are obtained, with 4 cases having good comparison ($R^2 > 0.7$).

Conclusions

• 4 out of 16 available collocated CALIOP and MPLNET profiles compare well above 400 m with $R^2$ greater than 0.7.
• Cases of poor comparison indicate possible confusion between cloud and dust aerosol by CALIOP.
• Extinction coefficient comparison mostly follows the same pattern as backscatter comparison.
• Further differences due to different backscatter-to-extinction ratios used by CALIOP and MPLNET.
• AERONET Size Distribution and Angstrom Exponent corroborate aerosol type identification by CALIOP.

References


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Monthly averaged profiles of MPLNET derived extinction coefficients for May 2009 to September 2010. No Level 2 MPLNET profiles were obtained for December 2009. Higher values of extinction are noticed at 2 to 4 Km during April and May, a period marked by heavy dust episodes. October to March are accompanied by high values of extinction near the surface (Misra et al, 2012).